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**(71) Patent Assignee: Nitto Denko Company**

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**(54) [Name of the Invention]**

**Sheet Material for Surface Light Source Device**

**(57) [Summary]**

**[Problem]**

The problem according to the present invention is to suggest a sheet material used for surface light source device where the operation of fixing of the sheet material at the time of the manufacturing of the surface light source device becomes easy and not only that but also where it is possible also to improve the fixing accuracy.

**[Solution Measures]**

In this sheet material 10, which transmits and reflects etc., light in the surface light source device, an adhesive layer 12 is formed on the edge part side A in a stripe type shape along the perimeter edge except on the surface part, which transmits, reflects etc., the light in the surface sheet, and on the top of the adhesive layer 12, a release paper 13, which has a surface area larger than that of the above described stripe shape, is adhered so that it can be released and so that it covers the adhesive layer 12.

**[Scope of the Claims]**

**[Claim 1]**

Sheet material used for surface light source device characterized by the fact that it is a material, which transmits and reflects etc., light in the surface light source device, where an adhesive layer is formed on the edge part side in a stripe type shape along the perimeter edge except on the surface part, which transmits, reflects etc., the light in the surface sheet, and on the top of the adhesive layer, a release paper, which has a surface area larger than that of the above described stripe shape, is adhered so that it can be released and so that it covers the adhesive layer.

[Claim 2]

Sheet material used for surface light source device according to the above reported Claim paragraph 1, characterized by the fact that the adhesive layer is formed by screen printing.

[Claim 3]

Sheet material used for surface light source device according to the above reported Claim paragraph 1 or Claim paragraph 2, characterized by the fact that the surface area of the release paper relative to the stripe shaped adhesive layer is in the range of 1.1 ~ 20 times.

[Claim 4]

Sheet material used for surface light source device according to any of the above reported Claim paragraphs 1 ~ 3, characterized by the fact that the sheet material is any of the following: a reflective sheet, a diffusion sheet, a light focusing sheet.

**[Detailed Explanation of the Invention]**

[0001]

**[Technical Filed of the Present invention]**

The present invention is an invention about a sheet material used in surface light source devices employed in liquid crystal display back light, transparent displays, illumination materials etc., different types of light source devices.

[0002]

**[Previous Technology]**

In the past, in the case of the thin form factor display devices using liquid crystals like in personal computers, word processors, liquid crystal displays etc., the liquid crystal material itself does not generate light and because of that the back light devices have been used where this liquid crystal display surface is illuminated from the back side surface. As such back light, because of reasons like the achievement of thin form factor of the display device itself, the achievement of compactness, etc., the edge light type surface light source devices have been used where at the edge surface of the light guiding plate a light source is positioned.

[0003]

Regarding this edge light type surface light source device, as it is shown in Figure 3, it has a structure formed from the light guiding plate 21, the light source 20, which is positioned on the side edge surface of the this light guiding plate 20, the reflective sheet

22, which is placed on the back surface side of the above described light guiding plate 21, and which reflects the light that is exit irradiated from the back surface of this light guiding plate 21, a diffusion sheet 24, which diffuses the light that is exit irradiated from the light exit irradiation surface of the above described light guiding plate 21, and the light focusing sheet 23, which focuses the light that has passed through this diffusion sheet 24 on the center part of the surface light source and increases the brightness on the front surface. This way, by using a diffusion sheet 24 and a light focusing sheet 23, the light path of the light that is exit irradiated from the light exit irradiation surface of the light guiding plate 21 is controlled. Also, in the space between each of the sheets – the above described reflective sheet 22, diffusion sheet 24, focusing sheet 23, in order to use the difference of the refractive indices with the air, so that the light diffusion effect, etc., would be increased, the air layers 25, are provided. According to Figure 3, 27 is a reflective cover reflecting the light from the light source.

[0004]

In the case of the above described surface light source device, at the time of the assembly, the light guiding plate 21, the reflective sheet 22, the diffusion sheet 24, the light focusing sheet 23, each sheet material is placed and positioned, and there is the problem that at the time of the handling, etc., a deviation of each of the sheets relative to each other can be caused, and the assembly accuracy becomes poor, etc. Then, in order to prevent the deviation of each of the sheets from each other and to improve the manufacturing properties, it is desirable that each of the sheet materials are fixed with respect to each other in their stacked state.

[0005]

This way, the fixing is conducted as the air layers 25 in the space between each of the sheet materials are maintained, the sheet materials are fixed with respect to each other and because of that each sheet material is manufactured only slightly larger than the effective surface area, which transmits the light etc., and the part of the side edge, which is protruding out of the above described effective surface part (the part A in Figure 3) is used and each of the sheets are stacked with each other.

[0006]

As the method for fixing of each of the sheet materials onto the above described part A of the edge part side, there are the heat sealing method, the adhesive agent method, the bonding agent method, etc., different types of methods. Among them, the method where a double adhesive sheet is used where a release sheet is placed on the adhesive surface of the adhesive sheet, is an excellent method to be used compared to the other method because of the fact that it is possible that the fixing of each sheet material can be conducted prior to the assembly technological process and the operational time is short, and a change in the position and later adjustment etc., are also easy. Then, as it is shown in Figure 3, each of the sheet materials are fixed with each other through the adhesive layer 26 of the double sided adhesive sheet.

[0007]

The fixing of each of the sheet materials through the above-described double sided adhesive sheet can be conducted according to the described here below. Namely, first, the double sided adhesive sheet is cut to the predetermined stripe type shape and the release paper that is on one surface is peeled off and removed and the adhesive surface is exposed, and on the adhesive surface that is exposed on this surface is adhered onto the part A of the edge side of the sheet material. Next, the release paper from the other surface of the double sided adhesive tape that has been adhered onto the sheet material is peeled off and removed and the adhesive surface is exposed and it is adhered onto the part A of the edge side of the other sheet material, and the sheet materials are adhered and fixed to each other as this double sided adhesive sheet is adhered, and the fixing is conducted.

[0008]

#### **[Problems Solved by the Present Invention]**

However, according to the above described method, an adhesive sheet, which has been cut to the predetermined width, is used, and because of that the width and the area of the adhesive agent and the release paper are the same, and it is necessary that from this state only the release paper be peeled off and removed. Because of that at the time of the removal of the release paper, it is necessary that the corner etc., of the release paper, is pulled by the fingertips and slightly separated, and this small separated part is squeezed by the fingertips, and it is gradually pulled and peeled off. This way, the operation of peeling off and removal is difficult and troublesome, and there is the problem that it has been said that the operation of fixing of the sheet materials to each other is extremely poor, and this has also become a reason for driving the cost increase.

[0009]

On the other hand, in the case of the most recent surface light source devices, together with the decrease of the form factor and the decrease of the weight of the different types of devices using the surface light source devices, it is desirable that the surface area of the parts that do not transmit etc., light, be minimized as much as possible. Consequently, in the case of the described here above, fixing conducted by using double sided adhesive tape and fixing each of the sheet metals to each other, it is desirable that the surface area of the part A of the edge side be minimized as much as possible, and that it be made into a shape that is as narrow as possible and together with that, it is desirable that the cut width of the adhesive tape be made also as narrow as possible and that the width of the adhesive layer 26 be made narrow. However, it is difficult to cut the double sided adhesive tape to a narrow width and also to cut it accurately, and because of that there has been the problem that at the time of the cutting, winding variations and sheet breaks are often generated. Also, it is extremely difficult to adhere with a good accuracy such narrow width double sided adhesive tape on the part A of the edge side of the sheet

material. Consequently, the width narrowing of the double sided adhesive sheet has limitations, and this also generates limits for the minimization of the form factor of the light source device body itself.

[0010]

The present invention is an invention that has taken such circumstances into consideration and because of that it is an invention that has as a goal to suggest a sheet material used for surface light source device where the operation of fixing of the sheet material at the time of the manufacturing of the surface light source device becomes easy and not only that but also where it is possible also to improve the fixing accuracy.

[0011]

#### **[Measures in Order to Solve the Problem]**

In order to achieve the above described goal, the sheet material used for surface light source device according to the present invention has the essential elements that it is a material, which transmits and reflects etc., light in the surface light source device, where an adhesive layer is formed on the edge part side in a stripe type shape along the perimeter edge except on the surface part, which transmits, reflects etc., the light in the surface sheet, and on the top of the adhesive layer, a release paper, which has a surface area larger than that of the above described stripe shape, is adhered so that it can be released and so that it covers the adhesive layer.

[0012]

Namely, in the case of the present invention, a stripe shaped adhesive layer is formed along the perimeter edge of the part of the edge side of the sheet surface and on the surface of this adhesive layer a release paper, which has a surface area larger than that of the above described stripe shape, is adhered so that it can be removed. Consequently, on the release paper covering the adhesive layer it is possible to have a part that has not been adhered with the adhesive agent. Then, at the time of the removal of the release paper, the above described non-adhered part is pulled and grasped by the fingers and pulled and by that it becomes extremely easy to remove the release paper. Because of that the operational properties of the operation of fixing of the sheets to each other at the time of the assembly of the surface light source devices, are significantly improved and it is possible to design a decrease of the assembly costs.

[0013]

Also, according to the present invention, in the case when the adhesive layer is formed through the screen printing process, it is possible to be formed so that the width dimension of the stripe shaped adhesive layer is narrow and also so that it is formed at a good precision. Because of that the surface area of the part A of the edge side is minimized as much as possible and it is formed to a narrow width, and because of that it

becomes possible to minimize the surface area of the part that is not effective in the transmitting, etc., of the light at the surface sheet, and it becomes possible to practically realize the minimization of the form factor of the body of the surface light source itself.

[0014]

#### **[Conditions of the Practical Implementation of the Present Invention]**

After that, the conditions of the practical implementation of the present invention will be described in details.

[0015]

Figure 1 shows the sheet material used for surface light source devices, according to the present invention. Namely, in this sheet material 10, the adhesive layer 12 is formed on the edge part side A in a stripe type shape along the perimeter edge except on the surface part 11, which transmits, etc., the light in the surface sheet. Then, and the surface of this adhesive layer 12, is covered by the release paper 13, which has a surface area larger than that of the above described stripe shape. In the state as it is adhered onto the adhesive layer 12, the above described release paper 13 forms the part 13 a, which does not adhere to the adhesive agent.

[0016]

As the above described sheet material 10, it is possible to use reflective sheet, diffusion sheet, light focusing sheet.

[0017]

As the reflective sheet, as long as it is a reflective sheet, which reflects at a good efficiency the light that has been transmitted by the light guiding plate, it is possible to use different types of materials. For example, it is possible to use porous polyester film, porous polyolefin film, etc. As this reflective sheet, it is preferred to use materials that have a reflective coefficient of at least 90 % or higher.

[0018]

As the diffusion sheet, it is possible to use different types of materials: it is possible to use transparent sheets that are formed from polyethylene terephthalate, polycarbonate, polystyrene, acrylic resin, methacrylic resin, etc.; different types of porous sheets where these transparent resin sheets have been made porous, indentation – protrusions imparting process processed sheets where the surface of the transparent resin sheets has been subjected to that treatment by sand blasting, solvent treatment, etc., the sheets where a diffusion layer has been formed on the surface by dispersing fine particles of resin made beads etc., into the transparent resin base, etc., and as long as these are materials that diffuse the transmitted light, different types of materials can be used. As this diffusion

sheet is preferred that it be a material where the light transmittance is at least 80 % or higher and the haze value is at least 80 % or higher.

[0019]

As the light focusing sheet, as long as it is a material that is made of transparent resin material, and where on the sheet surface prism shaped or web shaped protrusions are formed in multiple rows, or where numerous semi-spherically shaped or pyramid shaped protrusions are formed, and it has the function of focusing the transmitted light onto the center part, it is possible to use different types of materials, and there are no particular limitations.

[0020]

As the adhesive agent used for the formation of the adhesive agent, it is possible to use the following: acrylic type adhesive agents that have as their main components copolymers formed from n-butyl (meth) acrylate, 2-ethyl hexyl (meth) acrylate, iso octyl (meth) acrylate, iso nonyl (meth) acrylate, etc., (meth) acrylic acid alkyl esters, and (meth) acrylic acid, itaconic acid, etc., natural rubber type materials, styrene – butadiene – random copolymer type materials, styrene – isoprene – styrene block type, styrene – butadiene – styrene block type, styrene – ethylene – butylene - styrene block type, butyl rubber type, poly iso butylene type, etc., different types of rubber type adhesive agents, different types of silicone type adhesive agents, vinyl acetate type etc., different types of vinyl type adhesive agents, etc., however there are no particular limitations and it is possible to use different types of materials. Among these, also from the point of view of the thermal resistance properties, especially, the acrylic type adhesive agents are preferred. Also, it is a good option if in this adhesive agent, in order to decrease the brightness variations occurring by the reflection of light on the edge part, a light absorbing pigment material, etc., is contained and it is colored. Then, in this adhesive agent, optionally, depending on the requirements, it is also possible to compound different types of agents like: rosine type, cumaron – indene type, terpenic type, petroleum type, styrene type, phenol type, xylene type, etc., different types of adhesion aid agents, poly butene, poly iso butylene, poly isoprene, process oil, naphthene type oil, etc., softening agents, phenol type, amine type, etc., anti-ageing agents, ultra-violet light absorbing agents, titanium white, bright zinc, carbon curl, clay, talcum, carbon, etc., different types of filler agents, thiurame type, phenol type, iso cyanate type, etc., different types of crosslinking agents, etc.

[0021]

The coating of the adhesive agent onto each of the above described sheet materials can be conducted by the screen printing method, the coating by using a constant amount spray gun, brush coating, transfer method, etc., different types of methods, however, among these methods, the screen printing method is the most appropriate for conducting this coating. According to the above described screen coating method, there are the merits that it is possible to achieve narrow width of the stripe shape of the adhesive agent layer



and also to form that layer at a good precision and besides that it is said that the control of the thickness is also easy. As the coating pattern of the adhesive agent in this case, it is a good option if it is coated in a dotted line shape, dot shape, etc., different types of patterns, and there are no particular limitations.

[0022]

As the release paper it is possible to use plastic film that has been subjected to a surface lamination process where the surface is laminated with silicone resin, fluorine containing resin, etc., or paper materials where the surface has been subjected to coating or lamination by using the same materials, etc., different types of materials can be used and there are no particular limitations. As the thickness of the release paper, there are no particular limitations, however, from the consideration from the point of view of ease of handling, it is preferred that the thickness be within the range of 10 ~ 100 microns.

[0023]

Regarding the surface area of the release paper relative to the adhesive agent coated surface, it is preferred to be within the range of 1.1 ~ 20 times, and then it is more preferable if it is in the range of 2 ~ 15 times. Namely, if it is less than 1.1, at the time of the release of the release paper, the surface area of the part that is not adhered with the adhesive agent and that becomes the separation lever becomes too small, and an improvement of the operational properties is not expected. On the other hand, if the ratio exceeds 20 times, the surface area of the release paper of the part that is not adhered with the adhesive agent becomes too large, and at the time of the handling, sometimes the release paper is separated prematurely, and this causes variation, and there is the problem that it is said that the handling becomes difficult.

[0024]

The sheet material used for surface light source devices, for example, can be manufactured according to the following here below. Namely, first, the sheet parts like the reflective sheet, the diffusion sheet, the light focusing sheet, etc., are prepared. After that, on the part A of the edge side sheet surfaces of these sheets with the exception of the effective part, which transmits, reflects, etc., light on the surface sheet, through a screen printing process, an adhesive agent layer is formed in a stripe shape along the edge perimeter. After that, then on the surface of this adhesive agent, a release paper with a surface area that is larger than that of the above described stripe shape adhesive agent layer is adhered and the adhesive agent is covered.

[0025]

A surface light source device that is using the sheet material for surface light source devices that has the above described structure, is a device that can be assembled according to the described here below. Namely, first, the part 13a, which is not adhered to the adhesive agent layer 12 and which belongs to the release paper 13 of the sheet

material, is grasped by the fingers and this part is used as a lever part and it is pulled in the upward direction and it is separated from the surface of the adhesive agent layer 12 and the adhesive surface of the adhesive agent layer 12 is exposed. After that, each of the sheet materials where the adhesive surface has been exposed similarly (reflective sheet, diffusion sheet, light focusing sheet), and the light guiding plate are arranged and on the back of the light guiding plate the reflective sheet is placed and fixed through the adhesive force of the above described adhesive surface, and on the front surface of this light guiding sheet, the diffusion sheet and the light focusing sheet are stacked and fixed through the adhesive force of the adhesive surface. By that, the light guiding plate and each of the sheet parts (reflective sheet, diffusion sheet, light focusing sheet) are stacked and fixed and not only that but also in the space between each of the parts an air layer is formed. To that, a surface light source device, which has a light source attached to it can be assembled (as illustrate din Figure 3).

[0026]

#### **[Results From the Invention]**

As it has been described here above, in the case of the sheet material used in surface light source devices, according to the present invention, on the release paper covering the adhesive agent layer, it is possible to have a part that is not adhered with the adhesive agent. Then, at the time of the release paper separation, the above described part that is not adhered is used as a lever and it is grasped by the fingers and pulled and by that it becomes possible to extremely easily remove the release paper. Because of that the operational properties of the operation of fixing of each of the sheet parts to each other at the time of the assembly of the surface light source device, are significantly increased, and a decrease etc., of the assembly costs can also be designed.

[0027]

Also, according to the present invention, in the case when the adhesive agent layer is formed by using the screen printing process, it is possible to form a layer where the width dimension of the stripe shape of the adhesive agent layer is narrow and also it has good accuracy. Because of that it is possible to minimize the surface area of the part of the edge side as much as possible and to form a narrow width, and it becomes possible to minimize the surface area of the part that is not effective for the transmission etc., of the light on the sheet surface, and it becomes possible to practically realize the decrease of the form factor of the body of the surface light source device itself.

[0028]

After that, both practical examples and reference examples will be explained.

[0029]

### **[Practical Examples]**

It shows an example where the sheet used in surface light source devices, according to the present invention, is appropriately used as reflective sheet.

[0030]

As the reflective sheet a porous sheet was used that had a reflective coefficient of 96 %, a thickness of 150 microns, was formed from polyethylene resin, and had a porosity of 30 %. The above described reflective sheet was cut to the predetermined dimensions (170 mm x 230 mm), and it was set in a screen printing device, and as the adhesive agent, an acrylic type pressure sensitive adhesive agent was used and it was printed on the edge part of the above described reflective sheet at a width of 1.5 mm, and then, this was placed in a dryer and the solvent agent was removed, and the adhesive agent layer was formed. As the release paper, a material was used where on a 25 micron thick polyester film a silicone resin processing was conducted, and this material that has been cut to a width of 5 mm, was placed over the above described adhesive agent layer so that all of it was covered. After that, the above described covered by release paper film was, in order to be processed to the predetermined shape, was subjected to a punching technological process using a Thompson type punching die, and the reflective sheet, was obtained.

[0031]

### **[Reference Example 1]**

A double sided tape was used, which has been obtained as on both sides of a 25 micron thick polyester film acrylic type pressure sensitive agent has been placed and on its one side, a release paper, which has been obtained as a 50 micron paper has been processed by a silicone resin processing, has been placed and stacked. This double sided tape was cut to a width of 2.5 mm by using a slitter type cutter device, and this was adhered onto the edge part of the porous sheet used according to the Practical Example. After that, the same punching technological process was used as that in the case of the Practical Example, and a reflective sheet, was obtained.

[0032]

After that, for each reflective sheet obtained according to the above described Practical Example and according to the Reference Example, the operational properties of the assembly operation and the degree of precision of the adhesive layer, were measured.

[0033]

Regarding the assembly operation properties, a 2.5 mm thick, manufactured from acrylic resin light guiding plate, was used, and on the top of this light guiding plate, the operation of removing and separating the release paper from each of the reflective sheets and placing and fixing them, was conducted, and the evaluation was conducted as the number

of fixing processes that one operator is able to complete per unit time period for the Reference Example was used as the reference.

[0034]

Regarding the precision of the adhesive layer, it is evaluated as the apparent maximum width including the waviness (W2 according to Figure 2), and the practical time width at the time when the waviness is not considered (W1 according to Figure 2) are measured, and the evaluation is done by their difference ( $W2 - W1$ ).

[0035]

The evaluation results for the above described assembly operational properties and precision of the adhesive layer are shown in the table 1 below.

[0036]

**[Table 1]**

	Assembly Operational Properties	Adhesive Layer Precision (mm)
Practical Example	1.8	0.1
Reference Example	1	0.4

[0037]

From the above described Table 1, it is understood that according to the practical example, the assembled number per unit time period is higher, and the operational properties are improved. Moreover, at the time of this assembly operation, the removal of the release paper in the case of the practical example was extremely easy and contrary to that in the case according to the reference example 1, this removal was difficult. Also, it is understood that according to the practical example, the precision of the adhesive layer was also improved compared to that in the case of the reference example.

[0038]

**[Reference Example 2]**

The cut width of the double sided tape was made to be 1.5 mm, and everything else was conducted the same way as described according to the Reference Example 1 and an attempt was made to obtain a reflective sheet. However, the cut width was too narrow and at the time of the cutting of the double sided tape winding variations and sheet breaks were generated and it was not possible to obtain 1.5 mm wide, good precision cut and processed double sided tape, and as a result, it was not possible to obtain a reflective

sheet with a narrow width adhesive layer. Contrary to that, as it has been described here above, in the case of the practical example, a reflective sheet with a 1.5 mm width of the adhesive layer was obtained.

#### **[Brief Explanation of the Figures]**

[Figure 1]

Figure 1 represents a cross sectional diagram showing the sheet material used in surface light source devices, according to the present invention.

[Figure 2]

Figure 2 represents an explanation diagram showing the sheet material used in surface light source devices, according to the present invention.

[Figure 3]

Figure 3 is a cross sectional diagram showing a surface light source device.

#### **[Explanation of the Symbols]**

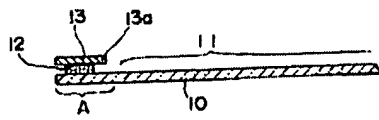
10.....sheet material (part, member)  
11.....effective surface part  
12.....adhesive layer  
13.....release paper  
A.....edge side part

**Patent Assignee: Nitto Denko Company**

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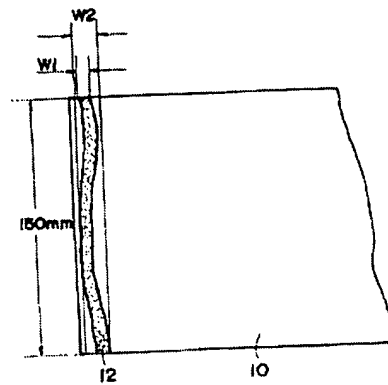
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【図1】

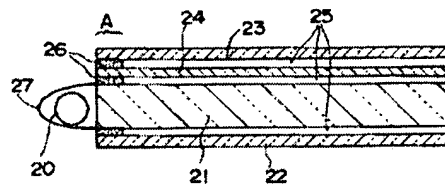


- 10: シート部材
- 11: 有効面部分
- 12: 粘着層
- 13: 剥離機
- A: 端部固定部分

【図2】



【図3】



(19) 日本国特許庁 (J P)

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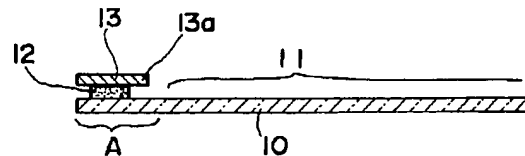
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(54) 【発明の名称】 面光源装置用シート部材

(57) 【要約】

【課題】面光源装置の製造時のシート部材の固定作業がしやすくなり、しかも固定精度を向上させることができる面光源装置用シート部材を提供する。

【解決手段】面光源装置において光を透過、反射等させるシート部材10であって、シート面において光が透過、反射等する有効面部分を除いた端部側の部分Aに、端縁に沿って帯状の粘着層12を形成し、この粘着層12の上に、上記帯状よりも面積が大きな剥離紙13を剥離可能に貼着して粘着層12を覆うようにしている。



10: シート部材

11: 有効面部分

12: 粘着層

13: 剥離紙

A: 端部側の部分

【特許請求の範囲】

【請求項 1】 面光源装置において光を透過、反射等させるシート部材であって、シート面において光が透過、反射等する有効面部分を除いた端部側の部分に、端縁に沿って帯状の粘着層を形成し、この粘着層の上に、上記帯状よりも面積が大きな剥離紙を剥離可能に貼着して粘着層を覆ったことを特徴とする面光源装置用シート部材。

【請求項 2】 粘着層がスクリーン印刷により形成されている請求項 1 記載の面光源装置用シート部材。

【請求項 3】 帯状の粘着層に対する剥離紙の面積が、1. 1～20 倍である請求項 1 または 2 記載の面光源装置用シート部材。

【請求項 4】 シート部材が、反射シート、拡散シート、集光シートのいずれかである請求項 1～3 のいずれか一項に記載の面光源装置用シート部材。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、液晶ディスプレイのバックライト、照明ディスプレイ、照明体等の各種面光源装置に使用される面光源装置用シート部材に関するものである。

【0002】

【従来の技術】従来から、パソコン、ワープロ、液晶テレビ等のような液晶を使用する薄型表示装置は、液晶自体が発光しないため、この液晶表示画面を裏面側から照射するバックライトが使用されている。このようなバックライトとしては、表示装置自体の薄型化、コンパクト化が可能であるという理由から、導光板の端面部に光源を設置したエッジライトタイプの面光源装置が採用されている。

【0003】このエッジライトタイプの面光源装置は、図 3 に示すように、導光板 21 と、この導光板 21 の一側端面に配設される光源 20 と、上記導光板 21 の裏面側に配設されこの導光板 21 の裏面から出射しようとする光を反射させる反射シート 22 と、上記導光板 21 の光出射面から出射される光を拡散させる拡散シート 24 と、この拡散シート 24 を透過した光を面光源の中心部分に集めて正面輝度を高める集光シート 23 とから構成されている。このように、拡散シート 24 および集光シート 23 を使用することにより、導光板 21 の光出射面から出射する光の光路をコントロールをするようにしている。また、上記反射シート 22、拡散シート 24、集光シート 23 の各シート部材の間には、空気との屈折率の差を利用して光拡散効果等を高めるようにするため、空気層 25 が設けられている。図 3 において、27 は光源からの光を反射する反射カバーである。

【0004】上記面光源装置では、組み立ての際に、導光板 21 と、反射シート 22、拡散シート 24、集光シート 23 の各シート部材を位置決めし、ハンドリング等

の際に各シート部材同士がずれてしまい、組み立て精度が悪くなる等の問題がある。そこで、各シート部材同士がずれるのを防止して生産性を向上させるため、各シート部材同士を積重状態で固定しておくのが望ましい。

【0005】このように、各シート部材間に空気層 25 を維持しながらシート部材同士を固定するために、各シート部材を光が透過等する有効面部分よりも若干大きく作製し、上記有効面部分をはみ出す端部側の部分（図 3 における A）を利用して各シート部材同士を固定することが行われている。

【0006】各シート部材の上記端部側の部分 A を固定する方法としては、ヒートシール法、接着剤法、粘着剤法等の各種の方法があげられる。これらの中でも、粘着剤シートの粘着面に剥離紙を重ねた両面粘着シートを使用する方法は、組み立て加工前に、各シート部材の固定を行うことが可能であり、作業時間が短く、位置ずれの手直し等も容易であり、他法に比較して優れた方法であるとして行われている。そして、図 3 に示すように、両面粘着シートの粘着層 26 を介して各シート部材同士が固定される。

【0007】上記のような両面粘着シートによる各シート部材の固定はつぎのように行われる。すなわち、まず、両面粘着シートを所定幅の帯状に切断し、片面の剥離紙を剥離除去して粘着面を露呈させ、この片面に露呈した粘着面を、シート部材の端部側の部分 A に貼り付ける。ついで、シート部材に貼り付けられた両面粘着シートの他面の剥離紙を剥離除去して粘着面を露呈させ、他のシート部材の端部側の部分 A に貼り付け、この両面粘着シートが貼着されたシート部材同士を貼り合わせて固定することが行われる。

【0008】

【発明が解決しようとする課題】しかしながら、上記の方法では、所定幅に切断された両面粘着シートを使用することから、粘着剤と剥離紙との幅、面積が同じであり、その状態から剥離紙だけを剥離除去しなければならぬ。このため、剥離紙を除去する際に、剥離紙の角部等を爪先等で引っ掛けて少し剥がし、この微小剥離部分を爪先等で挟んで徐々に引き剥がすようにしなければならない。このように、剥離のきっかけを作るのが困難で煩わしく、シート部材同士の固定作業の作業性が極めて悪いという問題があり、コスト引き上げの原因にもなっていた。

【0009】一方、最近の面光源装置は、面光源装置が使用される各種機器の小型化、軽量化にともない、光の透過等に有効でない部分の面積をできるだけ小さくすることが望まれている。したがって、上述したような、両面粘着シートを使用した各シート部材同士の固定にあたっては、端部側の部分 A の面積をできるだけ小さく、幅狭に形成するとともに、両面粘着シートの切断幅もできるだけ狭くし、粘着層 26 の幅を狭くすることが望まし

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い。しかしながら、両面粘着シートの幅を狭く、しかも精度よく切断することは困難で、切断時に巻きずれやシート切れが多発するという問題がある。しかも、このような幅の狭い両面粘着シートをシート部材の端部側の部分Aに精度よく貼り付けることも極めて困難である。したがって、両面粘着シートの幅狭化には限界があり、面光源装置自体の小型化にも限界が生じていた。

【0010】本発明は、このような事情に鑑みなされたもので、面光源装置の製造時のシート部材の固定作業がしやすくなり、しかも固定精度を向上させることができる面光源装置用シート部材の提供をその目的とする。

【0011】

【課題を解決するための手段】上記の目的を達成するため、本発明の面光源装置用シート部材は、面光源装置において光を透過、反射等させるシート部材であって、シート面において光が透過、反射等する有効面部分を除いた端部側の部分に、端縁に沿って帯状の粘着層を形成し、この粘着層の上に、上記帯状よりも面積が大きな剥離紙を剥離可能に貼着して粘着層を覆ったことを要旨とする。

【0012】すなわち、本発明は、シート面の端部側の部分に端縁に沿って帯状の粘着層を形成し、この粘着層の上に、上記帯状よりも面積が大きな剥離紙を剥離可能に貼着している。したがって、粘着層を覆う剥離紙に、粘着剤に密着しない部分ができる。そして、剥離紙除去の際には、上記密着していない部分をきっかけとして手指で摘み、引き剥がすことで、極めて容易に剥離紙を除去することができるようになる。このため、面光源装置を組み立てる際のシート部材同士の固定作業の作業性が格段に向上し、組み立てコストの低減等を図ることができる。

【0013】また、本発明において、粘着層をスクリーン印刷により形成した場合には、粘着層の帯状の幅寸法を狭く、しかも精度よく形成させることができる。このため、端部側の部分Aの面積をできるだけ小さく、幅狭に形成し、シート面の光の透過等に有効でない部分の面積を小さくすることが可能となり、面光源装置自体の小型化を実現することができるようになる。

【0014】

【発明の実施の形態】つぎに、本発明の実施の形態を詳しく説明する。

【0015】図1は、本発明の面光源装置用シート部材を示す。すなわち、シート部材10の、光が透過等する有効面部分11を除く端部側の部分Aに、帯状の粘着層12を設けている。そして、この粘着層12の上を、上記帯状よりも面積の大きな剥離紙13で覆うようにしている。上記剥離紙13は、粘着層12上に貼着された状態で粘着剤に密着していない部分13aが形成されている。

【0016】上記シート部材10としては、反射シ

ト、拡散シート、集光シートが用いられる。

【0017】反射シートとしては、導光板を透過した光を効率よく反射させるものであれば、各種のものが用いられる。例えば、多孔質ポリエステルフィルム、多孔質ポリオレフィンフィルム等があげられる。この反射シートとしては、反射率90%以上のものが好ましい。

【0018】拡散シートとしては、ポリエチレンテレフタレート、ポリカーボネート、ポリスチレン、アクリル樹脂、メタクリル樹脂等からなる透明樹脂シートを用い、これら透明樹脂シートを多孔質にした各種の多孔質シート、透明樹脂シートの表面にサンドブラスト、溶剤処理等で凹凸処理を施したシート、透明樹脂ベースに樹脂ビーズ等の微粒子を拡散させた拡散層を表面に形成したシート等、透過する光を散乱させて拡散させるものであれば各種のものが用いられる。この拡散シートとしては、光透過率80%以上、ヘイズ値80%以上のものが好ましい。

【0019】集光シートとしては、透明樹脂からなり、シート面に、プリズム状やウェーブ状の凸条を多数並べて形成したり、半球状やピラミッド状の突起を多数形成したものであり、透過する光を中央部に集める機能を有するものであれば、各種のものが用いられ、特に限定するものではない。

【0020】粘着層を形成する粘着剤としては、n-ブチル(メタ)アクリレート、2-エチルヘキシル(メタ)アクリレート、イソオクチル(メタ)アクリレート、イソノニル(メタ)アクリレート等の(メタ)アクリル酸アルキルエステルと、(メタ)アクリル酸、イタコン酸等のコポリマーを主成分とするアクリル系粘着剤、天然ゴム系、スチレン-ブタジエン-ランダム共重合体系、スチレン-イソブレン-スチレンブロック系、スチレン-ブタジエン-スチレンブロック系、スチレン-エチレン-ブチレン-スチレンブロック系、ブチルゴム系、ポリイソブチレン系等の各種ゴム系粘着剤、各種シリコーン系粘着剤、酢酸ビニル系等の各種ビニル系粘着剤等があげられるが、特に限定するものではなく、各種のものが用いられる。これらのなかでも、耐熱性の観点から、特にアクリル系粘着剤が優れている。また、これらの粘着剤には、端部での光の反射によって起こる輝度むらを低減させるため、光を吸収する顔料等を含有させて着色するようにしてもよい。さらに、これらの粘着剤には、必要に応じてロジン系、クロマン-インデン系、テルペン系、石油系、スチレン系、フェノール系、キシレン系等の各種粘着付与剤、ポリブデン、ポリイソブチレン、ポリイソブレン、プロセスオイル、ナフテン系オイル等の軟化剤、フェノール系、アミン系等の老化防止剤、紫外線吸収剤、チタン白、亜鉛華、炭カル、クレイ、タルク、カーボン等の各種充填剤、チウラム系、フェノール系、イソシアネート系等の各種架橋剤等を配合することもできる。

【0021】上記各シート部材への粘着剤の塗布は、スクリーン印刷法、定量吐出ガンによる塗布、刷毛ぬり法、転写法等各種の方法が行われるが、これらのなかでも、スクリーン印刷法が最も好適に行われる。上記スクリーン印刷法によれば、粘着層の帯状の幅を狭く、しかも精度よく形成させることができるほか、厚みのコントロールが容易であるという利点がある。この場合の、粘着剤の塗布パターンとしては、線状、点線状、ドット状等各種のパターンで塗布すればよく、特に限定されるものではない。

【0022】剥離紙としては、表面にシリコン樹脂、フッ素樹脂等のラミネート加工を施したプラスチックフィルムや、同じく表面にコーティング加工やラミネート加工を施した紙等各種のものが用いられ、特に限定するものではない。剥離紙の厚みとしては、特に限定するものではないが、取扱いやすさの観点から、10～100 μm程度が好ましい。

【0023】粘着剤塗布面に対する剥離紙の面積は、

1. 1～20倍程度が好ましく、2～15倍程度であればさらに好ましい。すなわち、1.1倍未満では、剥離紙を剥離する際に、剥離のきっかけとなる粘着剤と密着していない部分の面積が小さすぎ、作業性の向上が望めない。一方、20倍を超えると、粘着剤と密着していない部分の剥離紙の面積が大きすぎ、取扱の際に、予期しない時に剥離紙が剥がれたり、ずれたりし、取扱いが困難になるという問題がある。

【0024】本発明の面光源装置用シート部材は、例えば、つぎのようにして製作することができる。すなわち、まず、反射シート、拡散シート、集光シート等のシート部材を準備する。ついで、これらシート部材の、シート面において光が透過、反射等する有効面部分を除いた端部側の部分Aに、スクリーン印刷法により、端縁に沿って帯状の粘着層を形成する。つぎに、この粘着層の上から、上記帯状の粘着層よりも面積が大きな剥離紙を貼着して粘着層を覆う。

【0025】上記構成の面光源装置用シート部材を用いて、面光源装置は、つぎのようにして組み立てることができる。すなわち、まず、シート部材の剥離紙13の、粘着層12と密着していない部分13aを手指で摘み、この部分をきっかけとして上方に引っ張り、粘着層12の表面から引き剥がして粘着層12の粘着面を露呈させる。ついで、このように、粘着面が露呈された各シート部材（反射シート、拡散シート、集光シート）と、導光板とを準備し、導光板の裏面側に反射シートを、上記粘着面の粘着力により積重固定し、その導光板の表面側に、拡散シートおよび集光シートを粘着面の粘着力により積重固定する。これにより、導光板と各シート部材（反射シート、拡散シート、集光シート）が積重固定され、しかも各部材間に空気層が形成される。これに光源を取り付けて面光源装置が組み立てられる（図3参

照）。

【0026】

【発明の効果】以上のように、本発明の面光源装置用シート部材によれば、粘着層を覆う剥離紙に、粘着剤に密着しない部分ができる。そして、剥離紙除去の際には、上記密着していない部分をきっかけとして手指で摘み、引き剥がすことで、極めて容易に剥離紙を除去することができるようになる。このため、面光源装置を組み立てる際のシート部材同士の固定作業の作業性が格段に向上し、組み立てコストの低減等を図ることができる。

【0027】また、本発明において、粘着層をスクリーン印刷により形成した場合には、粘着層の帯状の幅寸法を狭く、しかも精度よく形成させることができる。このため、端部側の部分の面積をできるだけ小さく、幅狭に形成し、シート面の光の透過等に有効でない部分の面積を小さくすることが可能となり、面光源装置自体の小型化を実現することができるようになる。

【0028】つぎに、実施例について比較例と併せて説明する。

【0029】

【実施例】本発明の面光源装置用シート部材を反射シートに適用した例を示す。

【0030】反射シートとして、反射率96%、厚み150 μmのポリエチレン樹脂からなる気孔率30%の多孔質シートを用いた。上記反射シートを、所定寸法（170 mm×230 mm）に切断し、スクリーン印刷機にセットし、粘着剤としてアクリル系感圧接着剤を、上記反射シートの端部に、幅1.5 mmで印刷し、さらに乾燥機中に入れて乾燥させて溶剤を除去し、粘着層を形成させた。剥離紙として、厚さ25 μmのポリエステルフィルムにシリコン樹脂加工を施したものを、幅5 mmに切断したものを、上記粘着層をすべて覆うように重ねあわせて貼着した。ついで、上記剥離紙を貼着したフィルムを、所定形状に加工するために、トムソン式打ち抜き型を用いて打ち抜き加工を行い、反射シートを得た。

【0031】

【比較例1】厚さ25 μmのポリエステルフィルムの両面にアクリル系感圧接着剤を、その片面に厚さ50 μmの紙にシリコン樹脂加工を施した剥離紙を重ね合わせてなる両面テープを用い、この両面テープを、スリッター式切断機を用いて2.5 mm幅に切断し、これを実施例で使用した多孔質シートの端部に貼着した。ついで、実施例と同様の打ち抜き加工を行って反射シートを得た。

【0032】つぎに、上記実施例および比較例1の各反射シートの、組み立て作業性および粘着層の精度の測定を行った。

【0033】組み立て作業性は、厚み2.5 mmのアクリル樹脂製の導光板を用い、この導光板上に、各反射シ

ートの剥離紙を剥離除去して重ね合わせて固定する作業を行い、一人の作業員が単位時間当たりに固定加工できた数を比較例1を基準として評価した。

【0034】粘着層の精度は、150mm長さの粘着層の、うねりを含む見かけの最大幅（図2におけるW2）と、うねりを考慮しないときの実際の幅（図2における\*

\*W1)とを測定し、その差(W2-W1)で評価した。

【0035】上記組み立て作業性と粘着層の精度との評価結果を、下記の表1に示す。

【0036】

【表1】

	組み立て作業性	粘着層の精度 (mm)
実施例	1.8	0.1
比較例1	1	0.4

【0037】上記表1から、実施例では、単位時間当たりの組み立て個数が多く、作業性が向上していることがわかる。なお、この組み立て作業の際、実施例では剥離紙の除去が極めて容易であったのに対し、比較例1では、その除去が困難であった。また、実施例では、粘着層の精度も比較例1に比べて向上していることがわかる。

【0038】

【比較例2】両面テープの切断幅を1.5mmとし、他は比較例1と同様にして反射シートを得ようと試みた。しかしながら、切断幅が狭すぎて、両面テープの切断時に、巻きずれやシート切れが発生し、1.5mm幅で精度よく切断加工した両面テープを得ることができず、結果的に、粘着層の幅が狭い反射シートを得ることができなかった。これに対し、上述のように、実施例では、幅\*

※1.5mmの粘着層の幅が狭い反射シートが得られている。

【図面の簡単な説明】

【図1】本発明の面光源装置用シート部材を示す断面図である。

【図2】本発明の面光源装置用シート部材を示す説明図である。

【図3】面光源装置を示す断面図である。

【符号の説明】

10 シート部材

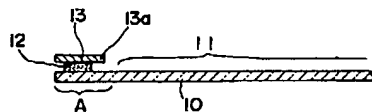
11 有効面部分

12 粘着層

13 剥離紙

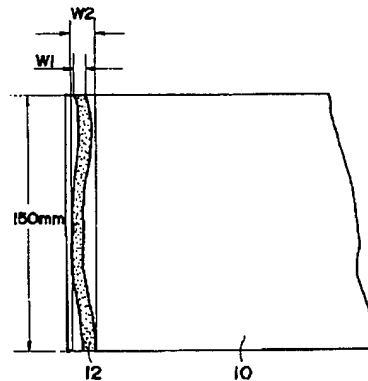
A 端部側の部分

【図1】

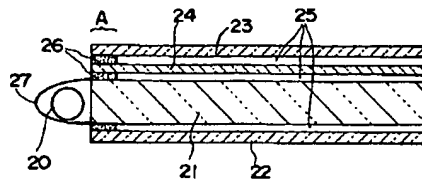


- 10: シート部材
- 11: 有効面部分
- 12: 粘着層
- 13: 剥離紙
- A: 端部側の部分

【図2】



【図3】



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G 0 9 F	9/00	3 3 6		G 0 9 F	9/00	3 3 6 J